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MÄNGURUUMIDE PROJEKTEERIMINE LASTELE AUTISMI SPEKTRIS

DESIGNING PLAY SPACES FOR CHILDREN IN AUTISM SPECTRUM

Bachelor's thesis

Curriculum in Environmental Planning and Landscape Design

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Tartu 2021

Eesti Maaülikool

Kreutzwaldi 1, Tartu 51006

Bakalauresetöö lühikokkuvõte

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Õppekava: Maastikukujundus ja keskkonnaplaneerimine

Pealkiri: Mänguruumide projekteerimine lastele autismi spektris

Lehekülgi: 50	Jooniseid: 17	Tabeleid: 5	Lisasid: 7

Osakond: Maastikuarhitekturi õppetool

ETIS-e teadusevaldkond ja CERC-l kood: Maastikukujundus, T250

Juhendaja: Jekaterina Balicka, Dipl.-Ing.

Kaitsmiskoht ja -aasta: Tartu, 2021

Selle uuringu peamine eesmärk on välja selgitada, milliseid omadusi on mänguväljakutel vaja, et need oleksid ASD-ga lastele mugavad. See annab neile võimaluse mängida oma mugavustasemel ja ületada füüsilisi ja emotsionaalseid väljakutseid, millega nad iga päev kokku puutuvad. Selle uurimistöö lõpptulemuseks on mänguruumi loomine, mis hõlmab sensoorset mänguala autismiga lastele. Andmete analüüs aitab koostada universaalseid soovitusi ASD-ga laste mänguruumi edaspidiseks kujundamiseks.

Märksõnad: lasteväljak, avalik mänguruum, lapsed, ASD

Estonian University of Life Sciences Kreutzwaldi 1, Tartu 51006	Abstract of Bachelor's Thesis
Author: Darja Korjukina	Curriculum: Environmental Planning and Landscape Design

Title: Designing play spaces for children in Autism Spectrum

Pages: 50	Figures: 17	Tables: 5	Appendixes: 7

Department: Chair of Landscaoe Architecture

Field of research and (CERC S) code: Landscape design, T250

Supervisor: Jekaterina Balicka, Dipl.-Ing.

Place and date: Tartu, 2021

The primary objective of this thesis is to find out what characteristics are required in playgrounds to make them user friendly for children with ASD. It will make them a chance to play at their own comfort level and overcome the physical and emotional challenges that they face on an everyday basis. The final result of this study is creating a play space, which includes a sensory playground for children with Autism disorder.

Keywords: playground, play space, children, ASD

CONTENTS

INTRODUCTION

It is widely known that children with special needs are less likely to achieve a high level of socialization and social adaptation without specialists. The playground can be the perfect place to practice different skills and experiences, from learning social skills to learning how the body reacts to various heights and speeds. I, as a youth worker and a landscape designer, consider play-spaces for children as a social environment.

Nowadays, there are not enough playgrounds designed with appropriate consideration for children with ASD or similar disorders. While inclusive playgrounds exist, they usually have one shortcoming or another such as lack of fences, excessive noise, wrong playground material or lack of particular design consideration for serving the needs of children with ASD. Since some children with ASD are hyper sensitive, visual, tactile and auditory design elements should also be part of the playground. As such, it is very important to have play spaces which take into account the needs and requirements of the children with ASD.

The primary objective of this thesis is to find out what characteristics are required in playgrounds to make them user friendly for children with ASD. It will make them a chance to play at their own comfort level and overcome the physical and emotional challenges that they face on an everyday basis. The final result of this study is creating a play space, which includes a sensory playground for children with Autism disorder.

Data analysis will help to draw up universal recommendations for the subsequent design of a play space for children with ASD. These recommendations will be based on the theory of sensory integration, as well as interviews with a specialist and a survey of parents conducted in the course of work.

SISSEJUHATUS

On laialt teada, et erivajadustega lapsed ei saavuta sotsialiseerumist ühiskonnas ilma spetsialistideta. Mänguväljak võib olla ideaalne koht mitmesuguste oskuste ja kogemuste harjutamiseks, alates sotsiaalsete oskuste omandamistest kuni nende õpetamiseni, kuidas keha reageerib erinevatele kõrgustele ja kiirustele. Noorsootöötaja ja maastikukujundajana, näen laste mänguväljakutel sotsiaalset keskkonda.

Praegu ei ole piisavalt mänguväljakuid, mis oleksid kavandatud ASD või sarnaste häiretega lastele. Kuigi kaasavad mänguväljakud on olemas, on neil tavaliselt mõned puudused, näiteks piirdeaedade puudumine, liigne müra, sobimatu mänguväljaku materjal või tähelepanu puudumine disainile, et rahuldada ASD-ga laste vajadusi. Kuna mõned ASD-ga lapsed on ülitundlikud, peaksid mänguruumi kuuluma ka visuaalsed, puutetundlikud ja kuuldavad kujunduselemendid. Seetõttu on väga oluline kujundada mänguväljakud, mis vastavad ASD-ga laste vajadustele ja eelistustele. Selle uuringu peamine eesmärk on välja selgitada, milliseid omadusi on mänguväljakutel vaja, et need oleksid ASD-ga lastele mugavad. See annab neile võimaluse mängida oma mugavustasemel ja ületada füüsilisi ja emotsionaalseid väljakutseid, millega nad iga päev kokku puutuvad.

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1. LITERATURE REVIEW

1.1. Nature of Autism

1.1.1. Autism: What is it?

Autism is a mental disorder, the main symptoms are a violation of social interactions and disorders in the emotional sphere. Autism, or Autism Spectrum Disorder (ASD), is a neurological developmental disability that usually appears in the first 3 years of life and that especially impacts development in areas of social, verbal, and nonverbal communication. ASD affects as many as 1 in 110 children, it is four times more prevalent in boys than in girls (Siegel 1996).

There are two main forms of Autism, Mild forms of autism which includes high-functioning autism (HFA) and Asperger Syndrome (AS). Another one is severe forms of Autism such as Rett Syndrome (RTT). Some of the prominent features are advanced academic abilities, advanced communication skills, delayed social skills, severe sensory issues, impaired sensory information processing, extreme difficulties with organizational skills, mental retardation, etc (Siegel 1996).

1.1.2. The Characteristics of Autism disorder in a child

As soon as the child reaches the age of one year, parents can notice the first manifestations of autism. A mild form of the disease is considered to be a violation of eye-to-eye contact, that is, when the baby does not look at the adult when addressing him and does not respond to speech. In addition, such a child may not smile at all at any attempt by a parent to make him laugh or, conversely, laugh when there is no reason for this (Nikolskaya et al 2005).

The main symptom of early childhood autism - difficulties in communication with other children. They are connected with the fact that the child cannot understand the rules of games, the emotions of peers, he is uncomfortable with them. As a result, he plays alone, inventing his own games, which most often look from the outside as stereotypical movements devoid of meaning. A tendency to move stereotypically, especially in the midst of stress, is another symptom of childhood autism. It can be swinging, bouncing, rotating, moving fingers, hands. With autism, the child develops a daily routine, following which he feels calm. In the event of unforeseen circumstances, outbreaks of aggression are possible, which can be directed at oneself or others (Nikolskaya et al 2005).

In preschool and early school age, learning difficulties are identified. Quite often, a symptom of autism in children is mental retardation associated with impaired functional activity of the cerebral cortex. But there is also highly functional autism, a sign of which is normal or even above average intelligence. With a good memory, developed speech, children with such a diagnosis experience difficulties in generalizing information, they do not have abstract thinking, and problems with communication arise in the emotional sphere (Nikolskaya et al 2005).

Signs of autism in adolescents are often exacerbated by hormonal changes. It also has an impact and the need to be more active, which is important for a full-fledged existence in a society. At the same time, by adolescence, an autistic child is already clearly aware of his dissimilarity from other children, which is why he usually suffers greatly. But there may be the opposite situation - puberty changes the character of a teenager, making him more sociable and stress-resistant (Nikolskaya et al 2005).

In autism, the child, as a rule, cannot connect the details of any actions into one chain. A child with autism in almost every case cannot distinguish between animate and inanimate objects, and sees a person not as a single whole, but as a "set" of separate parts of the body. All surrounding external influences (touch, light, sound, close contact) have an irritating effect on the autistic person, so the patient most often closes in on himself and refuses to make contact even with close people (Nikolskaya et al 2005).

1.2. Sensation and Play

1.2.1. Sensory Integration

Sensory integration is a process during which the human nervous system receives information from the receptors of all senses, then organizes and interprets them so that they can be used in targeted activities. Sensations give us information about the physical condition of our body and our environment (Iris 2005).

Dr. Jean Iris, founder of the theory of sensory integration dysfunction and developer of sensory integration therapy, emphasizes the importance of developing 8 types of sensations in a child (Figure 1). According to her, more than 70% of children with any deviations in the development of speech, motor and emotional spheres, problems with learning, behavior, communication, have a violation of the sensory systems (Iris 2005).

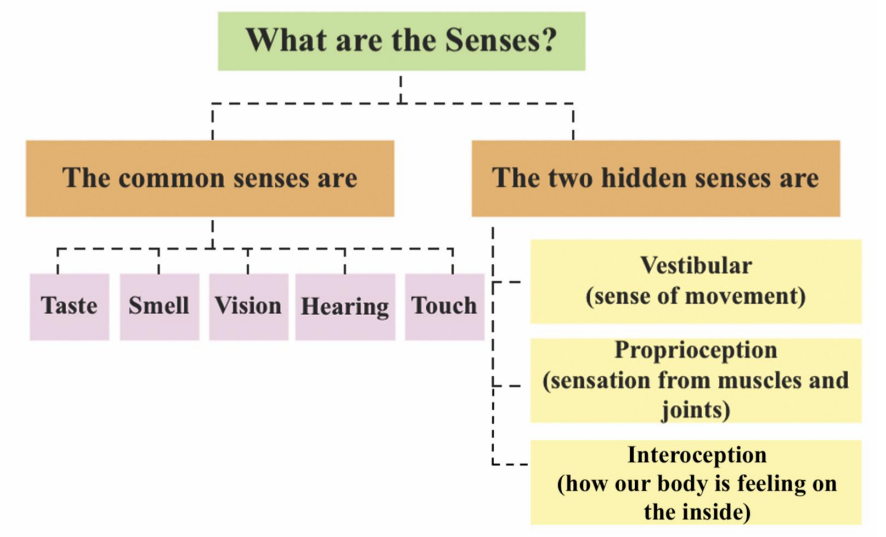

Figure 1. 8 types of sensations (Author: Darja Korjukina; Source: Iris 2005)

Everyone is well aware of the basic sensory systems: vision, taste, smell, hearing and tactile. These "external" senses respond to stimuli from the environment. However, there are also "internal" feelings in our body: interoceptive, proprioceptive and vestibular. These body-oriented sense systems operate outside of conscious thoughts and we cannot control their work (Iris 2005).

Children with ASD present atypical responses to sensory stimuli, which intensify their structured and stereotyped behavior. The need for visual boundaries, diminished response to potential hazards, and a preference for exploration through touch, taste and smell versus visual and auditory cues affect play opportunities for children with ASD (Iris 2005). From time to time, we also have a problem with the perception of sensory integration, for example, with a long lack of healthy sleep, it will lead to insomnia, which will lead to impaired concentration of movement and attention .

Sensory therapy is work through the body. The method helps to improve praxis, both from its simple manifestations - to pull your hand away from hot water, to more difficult - to dress yourself, learn to write, answer a question, plan a route.

1.2.2. The value of Play in child development

Play is not only a source of joy, but also a learning tool, which is a basic and natural process for a child's development. While playing, children explore their physical environment, express emotions and build vocabulary, it is a really important tool for the cognitive,

physical, social and emotional development of children, as well as their imagination and creativity (Gray 2013).

A play, first of all, is an activity that is freely chosen, but not free in form. There is a structure in the game, and this structure is formed from the rules in the mind of the player. The rules of the game are the means. To play means to behave in accordance with the chosen rules. “Freedom to quit is an essential aspect of play's definition” – emphasizes the professor Peter Gray. Free play - when children have complete freedom to play on their own. They can choose the game they want - and have a wide variety of activities, playable content, and even storyline. Free play gives children the opportunity to express what they are going through on a particular day, time or situation (Gray 2013).

In the game, the child learns:

- Emotionally get used to the social world of adults.
- Experience the life situations of other people as your own, understand the meaning of their actions and deeds.
- Realize your real place among other people.
- Respect yourself and believe in yourself. Solving game problems, children show maximum competence, they act confidently, without asking questions or asking permission from an adult. Play is an arena for children's successes and achievements.
- Rely on their own strength when faced with a problem. Play provides children with the opportunity to set and solve their own problems. Children who have a lot of play practice cope with real life problems more easily than those who play little.
- Express your feelings freely. A child living under the constant supervision of an adult begins to behave unnaturally. He is not bold and decisive enough to reveal his true feelings, which makes his behavior stiff.
- Experiencing your anger, jealousy, anxiety and worry. In the free play of children, fear, aggression and tension find a way out and weaken, which greatly facilitates real relationships between children (Vigotsky 2004).

In the game, the child acquires new and clarifies the knowledge he already has, activates the vocabulary, develops curiosity, inquisitiveness, as well as moral qualities: will, courage, endurance, the ability to yield. The child in the game depicts what he / she saw, experienced,

he / she masters the experience of human activity. The game develops an attitude towards people and towards life (Vigotsky 2004).

1.2.3. Play environment for children with autistic disorder

The peculiarities of a child's development with autism spectrum disorders and a variety of types of disorders (cognitive, communicative, social, behavioral) require the creation of specific conditions for their elimination, the most important of which is the organization of the developmental and play environment. A well-organized developmental environment provides sensory and emotional comfort for every child. In a specially adapted environment, it is easier for an autistic child to assimilate the social functions of various objects, rooms, to form ways of socially acceptable actions with objects. Adaptation of the developmental environment for a child with ASD takes place in three main areas: the organization of space, the organization of time and the organization of the social environment (Haustov 2014).

However, if we talk about the play environment, then only 2 areas will be taken into account - the organization of space and the organization of the social environment.

Orderliness	In order to create an ordered space, it must be “zoned”. "Zones" should correspond to the types of activities performed in them and be equipped in accordance with their functional purpose. (Haustov 2014).
Attractiveness	Often, children with ASD are not motivated to play, so the play space must take into account the interests and needs of the child with ASD. The playground should encourage you to explore it (Haustov 2014).
Recreation area	The recreation area will serve as a balance between active and quiet activities. Especially useful for children with hyperactivity. Aromatic plants, birdsong, secluded spots and the opportunity to lie down can serve as a calming effect.
Functionality	Non-congested space. All objects in the child's field of vision should be functional and give a clear understanding of what and where they could do. “Non-functional” objects can distract a child from the process of cognition of the surrounding world and scatter his attention (Haustov

	2014).

Table 1. Recommendations for organizing space

Recommendations for organizing social environment

Visual hints for orientation	Visual aids (information signs, pictograms, illustrations of behavior rules, visual scenarios) to help an autistic child navigate the world around him and form adaptive social behavior (Haustov 2014).
Availability of alternative means of communication	Alternative means of communication include, for example, a communication board that depicts the child's physiological needs (toilet, water, food, ...) and basic communication needs (asking for help, consent, refusal). These illustrations will greatly facilitate the child's interaction in the new environment for them and help to avoid unwanted problem behavior (Haustov 2014).

Table 2. Recommendations for organizing social environment

The organization of the social environment is of particular importance for the socialization of children with autism spectrum disorders. It is under the influence of the immediate social environment that the child develops the skills of interpersonal interaction, social play, cooperation and communication (Haustov 2014). In this case, the play environment will be one of the methods of communication between the ASD child and the parent / peer / teacher.

1.3. Playground Standards and Safety

Risk is an important and natural part of the game. The knowledge and experience gained in the playgrounds form the basis for subsequent risk assessment skills and their power to overcome them.

However, the safety of children in the playground should not be underestimated and risks carefully controlled. When creating the conditions for the game, it is important to find a balance between risk margin and serious injury. On such a playground, children independently learn what is safe for them and what is not (Dewey 1974).

An appropriate level of safety is the key word when planning playgrounds. The most important safety requirements are the prevention of entanglement of the head and neck and protection against inadvertent falls. These are threats that can have serious consequences.

The safety requirements for the equipment and surfaces of public playgrounds are laid down in the European standards EN1176 and EN1177, which have been transferred to the Estonian standards. The standards define the requirements for safety, installation and maintenance of the product. These standards are binding on both manufacturers and installers and owners. A playground is a structure that belongs to buildings within the meaning of the Decorating Act and is therefore subject to the safety requirements set out in the Building Act. However, play equipment is not a construction product and is not subject to construction products regulation. For play equipment, general product safety must be considered.

1.3.1. Playground cover

The EVS-EN 1177 standard establishes the requirements for high equipment of playgrounds (where children play at a height of more than 600 mm) there must be a suitable surface underneath. This principle also applies in the immediate vicinity of play equipment such as swings, carousels and slides, in which case it does not depend on the height of the equipment. It should be borne in mind that these coverings do not protect against all head injuries, but nevertheless significantly reduce the risk of their occurrence. The standard also allows the use of a well-groomed lawn with a fall height of up to one meter.

1.3.2. Playground equipment

EVS-EN 1176 applies to all playgrounds and equipment on them and deals with general safety requirements and test methods. The safety rules depend on the type of threat on the play space. To ensure a safe playground environment, the following points should be avoided.

- Stuck head and neck / the whole body / foot / leg
- Catching clothes on something
- Falling from great heights
- Collisions of players
- Improper finish or constructor defects

2. CASE STUDY

2.1. Successful examples of playgrounds for children with ASD

One of the questions in the questionnaire of parents raising children with autism disorder was about their favorite playground. Based on the above mentioned recommendations, I chose the 3 successful examples that I liked the most.

2.1.1. Lafayette Playground (San Francisco, USA)

Despite the lack of visual hints and alternative communication methods on the playground, the playground attracts with its individual design (Appendix 1.). Especially popular with preschool children.

Orderliness	The park is divided into two zones - active zone and zone with water play. Playground is completely enclosed with a fence, and gates that latch.
Attractiveness	Children's playground with unique equipment. 5 types of slides and all kinds of climbing structures - nets, castles, monkey bars, twisty slides, twirl poles, bridge. The most attractive area is the water area, with an extensive water structure.
Recreation Area	Outside the playground is a walking park.
Functionality	Each element of the playground is understandable and aims to develop tactile, vestibular and proprioceptive sensation.
Visual hints for orientation	Absent
Alternative means of communication	Absent

Table 3. Analyses of Lafayette Playground

2.1.2. H!gh Five Autism Park (New Castle County, USA)

High Five is one of the first inclusive parks (Figure 3.) designed with the needs of children with autism in mind. The park takes into account the social interaction of children, as well as children who want to be alone. The playground is fenced off and there is an entrance, next to which there are benches for the parents.

Orderliness	The playground is divided into zones of paths that run through the entire playground. The site is divided into the following zones - a music, reflection sphere and a zone aimed at the development of vestibular sensation.
Attractiveness	The main element of the site is a mirror ball, which attracts the attention of all its visitors.
Recreation Area	Outside the playground is a walking park.
Functionality	Every part of the park has a meaning, from the large mirrored sphere at the entrance to the music area with bells, xylophone, drums and interactive soundboards. The mirror sphere, according to the designers, stimulates the visual sensations, and the music reproduction encourages children to work with their hands.
Visual hints for orientation	Circular paths run along the perimeter and inside the playground, which helps children to orient themselves.
Alternative means of communication	Absent

Table 4. Analyses of H!gh Five Park

2.1.3. Sensory Arts Garden (Florida, USA)

The Sensory Arts Garden at Els Center of Excellence is specifically designed for people with autism. By interacting with plants and materials that engage the senses - sight, smell, touch, taste, sound - and movement, the garden provides a much-needed balance of stimulating and soothing sensory experiences.

Orderliness	The garden is surrounded by green vegetation around the perimeter.
Attractiveness	Many plants grow in the garden, which attract with their scent and color. The perfect place to enjoy the beauty of nature.
Functionality	Children can explore calming and alerting sensory experiences such as different colors, textures, smells, and sounds
Visual hints for orientation	The overall layout offers clear road circulation, clear settings and destinations, starting with two clear arrival sequences at the north and south entrances.
Alternative means of communication	Absent

Table 5. Analyses of Sensory Arts Garden

3. METHODOLOGY

The overall goal of this study was to conduct qualitative research, to specify the characteristics of a playground for attracting children with the autism spectrum, and to draw up universal recommendations on the principles of play environment design for children with the autism spectrum. The study process was divided into 2 stages - the review of literature and the design of the play space.

For an in-depth study of the theoretical part of the autistic disorder analysis was undertaken, using available library and internet research databases and resources. Besides the literature research, both the opinion of a specialist and the parents of raising children with autism spectrum disorder were important for me. Thus, the questionnaire and interviews were chosen as the method of the first study.

Inna Grishakova, a child school psychologist who works with children with special needs, including children with autistic disorder, was the first interviewee. The interview took place online, on the Zoom web site in March 2021, with a pre-agreed suitable time. The work contains excerpts from interviews.

The purpose of the questionnaire was to identify the needs of children in a play environment, such as annoying and encouraging factors, favorite activity in the open air, as well as the personal opinion of the parent, that their child needs on the playground. The survey was compiled in Google Forms and was carried out in an anonymous form on a voluntary basis. The parents who took part in this survey are members of the Facebook group "Особики. Дети с особыми потребностями в Эстонии.", In which I left a message about the request to respond to my questionnaire.

The next stage of study is the design of the play area, which includes an analysis of the planned area and the design itself.

The territory of the project was not chosen by chance, one of the important factors was a quiet area and not near schools or kindergartens. At this stage, I visited the Children's playground of Ihaste in the Winter semester of 2020/21, and also took the necessary pictures of the territory for analysing. These evaluation approaches were analysis of recreation and green area and adjacent roads around the focus playground. The principle of design was

based on recommendations from the chapter on Play environment for children with Autistic disorder and needs of children and their parents from the analysing of the questionnaire .

4. DATA ANALYSE

The theoretical part focused on the general characteristics of children with autism disorder. And knowing that in this disorder most of the problems are associated with sensory integration, nevertheless, children are all different and even with one disorder there will be a different reaction to environmental factors. This was the reason for the questionnaire and interview, during which the preferences of children in the play environment were analyzed.

4.1. Questionnaire

4.1.1. Parents

The survey involved 34 parents raising children with autism spectrum disorder of different age groups, among whom the age of 4-6 years - 29.4% (10 respondents) was the most popular, 7-9 years - 23.5% (8 people) , 10 - 12 years old and 12+ for 17.6% (6 people) and less age group 1 - 3 years old - 11.8% (4 people) (Figure 2 .). There is a logical explanation for this, since in the first years of life the child is less interested in the playground and spends more time surrounded by his parents.

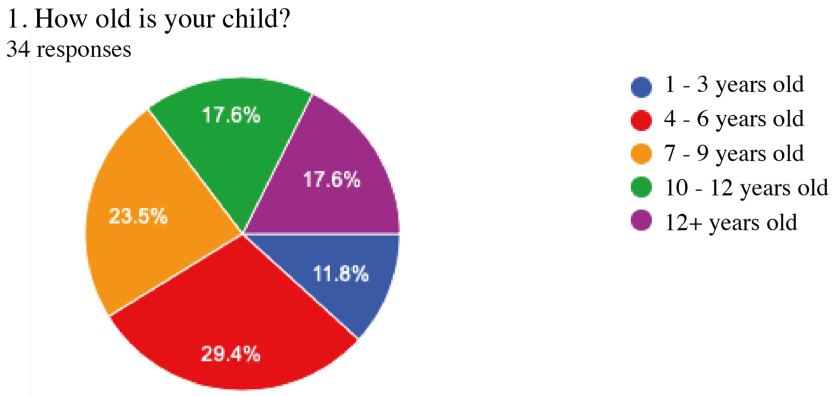

Figure 2. Diagram of child age group

In the question about their children's favorite activity outside, the majority (64.7% - 22 respondents) voted for the option of active recreation, such as running / jumping / climbing, etc. Some also specified that in addition to outdoor activities, their children love playing with sand and on the swings. And only 6 people (17.6%) answered that their children prefer a calm type of outdoor recreation (Figure 3.).

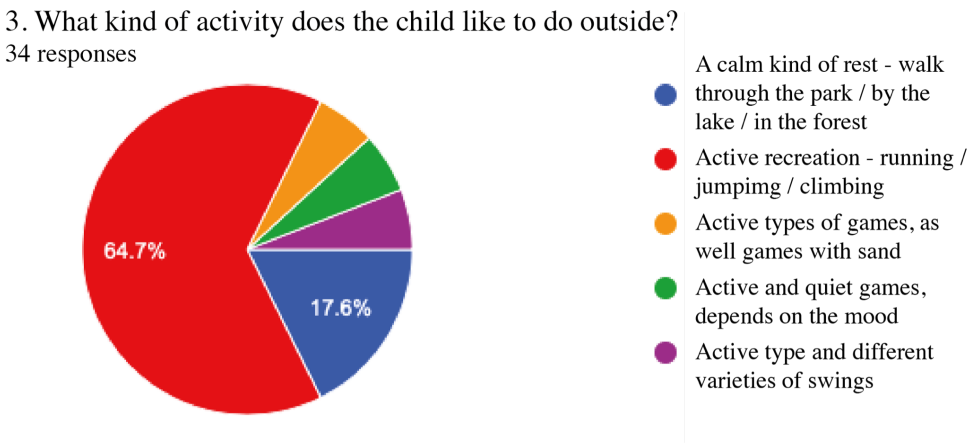

Figure 3. Diagram of favourite kind of outdoor activity

Describing the ideal play environment for their child, respondents shared the following:

- *the presence of a sandbox, preferably fenced, but not sandy cover. The ability to jump, run, slide and some devices to climb. Any carousel or swing. Any structures on springs so that the child can swing independently. Rubber coating;*
- *a swing on which the child can swing while lying down. Rest areas with single or double structural elements, where the child can recover from sensory overload. Enough distance between the individual elements of the playground;*

- *If this is a public playground, say, on the promenade, then this is a playground fenced on three sides with a soft rubber coating with benches for parents inside the playground itself. From the elements - slides and constructions for coordination. The colors are not so important, but they should be clear so that you can repeat the colors in the process - for example, to tell a child - climb a yellow slide and go to jump on a black trampoline.*

Based on the question about irritating factors in the playground, 14 respondents (41.2%) indicated that this factor is the ability to play with other children of their own age. The reason for this is that children with autistic disorder do not always understand the rules of the game and prefer to play alone. The second place among the annoying factors is the abundance of play elements - this option was chosen by 6 respondents (17,6%). With a large selection of game elements, the child may get confused, which will lead to a loss of interest in the game. 4 respondents indicated that one of the annoying factors is the fence around the playground.

In addition to the above factors, it is also worth noting - noise, crowding of people, queue for the swing, close location of game elements and their insufficient number (Figure 4.).

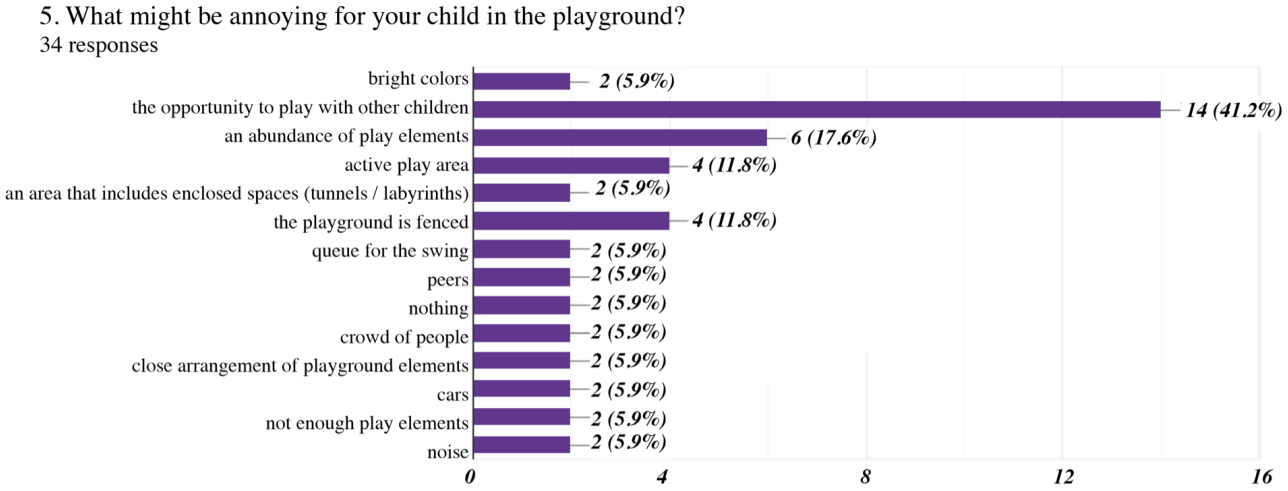

Figure 4. Diagram of annoying factors in the playground

In conclusion, it can be noted that children with autistic disorder prefer active games, especially swinging on a swing and climbing. Many parents have also said that they find the rubber cover to be safe. To reduce annoying factors, it is worth paying attention to the location of play structures so that a child who is annoyed to play with other children can find a place for himself to play on his own.

4.2. Interview

4.2.1. Specialist

Inna Grishakova is a child psychologist working at the Alexander Pushkin School in Tartu. The school has classes in which children with special needs are also studied. The task of the psychologist is to help children learn in an emotional sense, she also conducts sensory therapy lessons for children with the autism spectrum (including for other children with special needs). During the interview with Inna, the following topics were touched upon - sensory therapy, examples from personal work experience and recommendations that help to calm down a child when emotionally aroused.

As stated in theory, children with the autism spectrum have common behavioral characteristics, the first signs that can be found in the first years of life. Children with autism

need special conditions, forms and methods of education. One of these methods is sensory therapy:

- *Sensory integration for children with autism spectrum disorders will help to cope with unwanted behavior, enhance the child's cognitive activity, increase the variability of play and behavior in general, reduce anxiety, and improve play interaction. Classes are held in a playful way, which is very pleasant for children and is necessary to maintain their motivation. Basically, in the classroom, materials are used to work with the tactile, vestibular and proprioceptive systems, since they constitute the primary basis for the development of the child. For the tactile system, this can be a dry pool, a variety of loose and sticky materials (sand, cereals), which will help to better feel the body. For the development of the vestibular system - various swings, a trampoline, fitballs, balance weights. For proprioceptive - weighted blanket, heavy balls and more.*

Children with autism often behave in ways that are unacceptable to society: they say and do something strange, sometimes annoying or even frightening. In addition, strange behavior can be a reaction to a stimulus and works according to the reflex principle.

- *As you know, it is difficult for children with ASD to find a common language with other people and sometimes communication can be at the level of sounds. One example - the child did not speak, but understood everything. However, in an unpleasant situation for him, he could start issuing squeals, run away or fight. In such situations, a communication board helps a lot;*

- *In the middle school was a boy for whom one of the annoyances was open doors. The first thing he did was run to close them. This is due to the fact that children with ASD love order and need a schedule for a comfortable life. They need to understand the functionality of each item.*

The next question to Inna sounded as follows, what methods she uses if the child is emotionally excited and what can become the causes of emotional arousal.

- *Emotional arousal can be in the form of aggression, hyperactivity, this is associated with the accumulation of emotional stress. Emotional stress can be triggered due to changes in routine, insomnia, etc. Our school has a sensory therapy room where I*

work with children one-on-one. The room is divided into zones, one of which is a recreation area. The task of this zone is to create favorable conditions for the child, in which he will emotionally and physically relax. For example, lie down in a hammock with your eyes closed and soothing music will play in the background.

From the above data, it can be concluded that children with autistic disorder require special attention. Working with a psychologist can be not only at the school level, but also with the family at home or outside. Since the playground environment can be a new place for a child, it can be a cause of emotional excitement, therefore, special attention should be paid to the recreation area.

5. DESIGN

The focus area design is found in Tartu, in the district of Ihaste (Pallase puiestee 43, 51011), located on the left bank of the Emajõgi river, in the south-eastern part of Tartu (Figure 5.). The area of the district is 424 hectares and the population density is conducive to 547 people per square km. It is due to the fact that Ihaste is located on the outskirts of Tartu, it is very calm and the perfect place to relax from the city bustle.

Figure 5. Map of Tartu and Ihaste location (Source: Tartu.ee; Author: Darja Korjukina)

Currently, there is also a playground with a volleyball field (Appendix 2.). The advantage of this territory is that Oaks, Osin, Spruce and Birch are growing on it, which indicates the fertility of the soil. As well as the crowns of trees will create a shadow of the sun. The presence of trees simplifies the creation of a touch garden, which is one of the park's zone.

5.1. Site analyse

The surroundings of the planned park are largely located residential buildings of a one-storey and two-story building. The area is rich in forests, which is difficult to say that they develop along with the area. At the same time, there are no schools and kindergartens in the area and the design of the park can induce the city to think about the construction of children's institutions (Figure 6.).

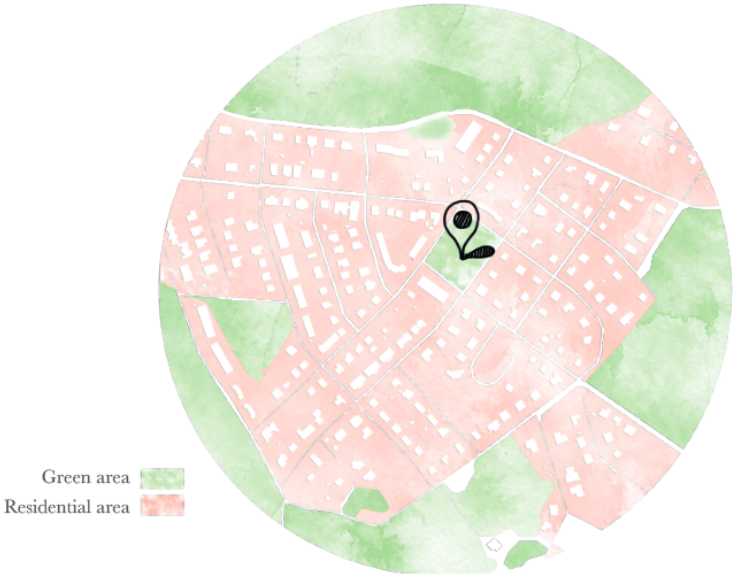

Figure 6. Urban environment of Ihaste

Another thing of notice is that in the area there are mainly people with prosperity and most families have a car, so the demand for public transport is low. However, you can get to the area of Ihaste by bus 5 and 12. The path of the bus just runs across the road, passing around the playground and a bus stop is located 5 minutes from the park. There is a chance that with increasing new visitors to the park, new route paths running through the Ihaste area will be developed (Figure 7.).

Figure 7. Bus ability of Ihaste

Speaking of pedestrian roads, their condition and presence leaves much to be desired. The asphalt pedestrian road passes only on one side of the playground. Mainly pedestrians come to move from the edge of car roads, although road traffic on this site is quiet. Also, pedestrian paths pass through the nearby forest (Figure 8.).

Figure 8. Walkability of Ihaste

In addition to pedestrian roads, there is a bicycle road. The road held at the playground has divided, where one side is intended for pedestrians and the second side for cyclists. Also at the entrance to the park there is a city bicycle parking "Pallase", organized by Smart Bike. Parking is designed for 17 bikes (Figure 9.).

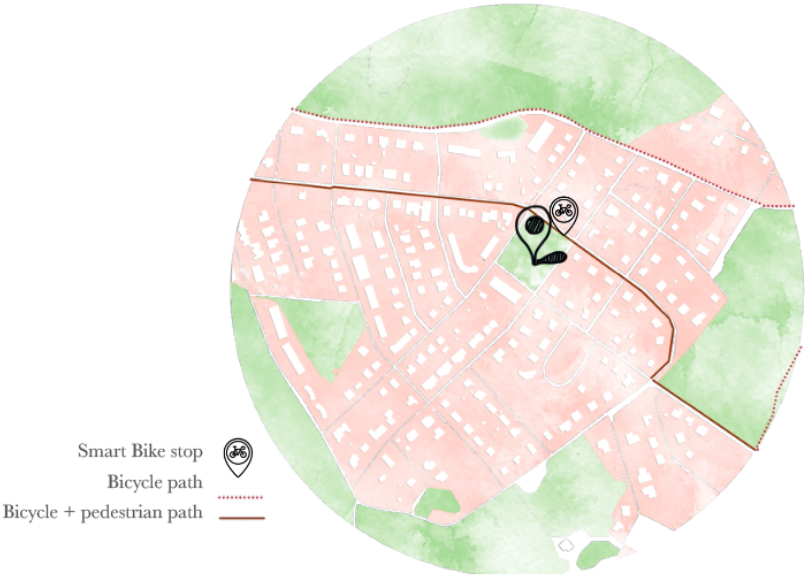

Figure 9. Cycleability of Ihaste

5.2. Concept Development

The main goal of the design is to create not just a play environment, but to make this environment interesting for children with autistic disorder. The concept design of the park is based on the theoretical part, and also takes into account the wishes of the parents who took part in the survey. The concept design consists in dividing the park into zones, which offers physical, tactile, visual and sonic experiences encouraging children to explore and develop.

The design of the playground is inspired by a logic game - Rubik's cube, one of the mothers participating in the survey, shared that her child is very attracted to this toy. The Rubik's cube has an understandable shape and divides equal parts into a cube. Collecting a cube by color - we collect it by "zones", which also gives a clear understanding of borders for children with autistic disorder.

The design principles are recommendations for setting up the environment for children with ASD and are detailed in the chapter “1.2.3. Play environment for children with Autistic Disorder". Design principles include - orderliness, attractiveness, recreation area, functionality, visual hints and alternative means of communication.

5.3. Design Plan

The design of the plan began by defining the volume of trees in the site. There are quite a lot of trees growing on the territory and the goal was to preserve all the existing plants. Once the planted and vacant areas were identified, work began on re-routing the road. Before that, there was a well-trodden path on the territory, but the new design involves a new asphalt road that runs through the entire park and defines the boundaries of the zones. The next step is the distribution of the park's zones and the design of play equipment. At this stage, 3 zones were formed - active zone, sensory - rich zone and sensory garden (Figure 10).

Figure 10. Masterplan of Playground [Original scale 1:250] For full size plan see Appendix 7.

5.3.1. Active zone

Located in the center of the park, in the shade of trees. Based on the name, it can be understood that the zone is intended for active games and is equipped accordingly. This zone plays an important role in the development of 2 sensations - sense of movement (vestibular) and sensation from muscles and joints (proprioception).

One of the main elements of the playground is a swing arranged in a circle and includes three types of swing - swing for one person (6 pieces); swing bench (4 pieces); cobweb swing (4 pieces). The swing is located at a safe distance from each other (2 m) and from the center and is suitable for swinging children and adults.

Most likely one of the fascinating elements will be slides made in the form of a hexagon - two types of slides of different heights (Figure 11). The height of a small slide of 1.2 m is suitable for children under 5 years old. The height of the large slide is 2.2 m and is suitable for children over 5 years old. The slides are interconnected by a hinged tunnel.

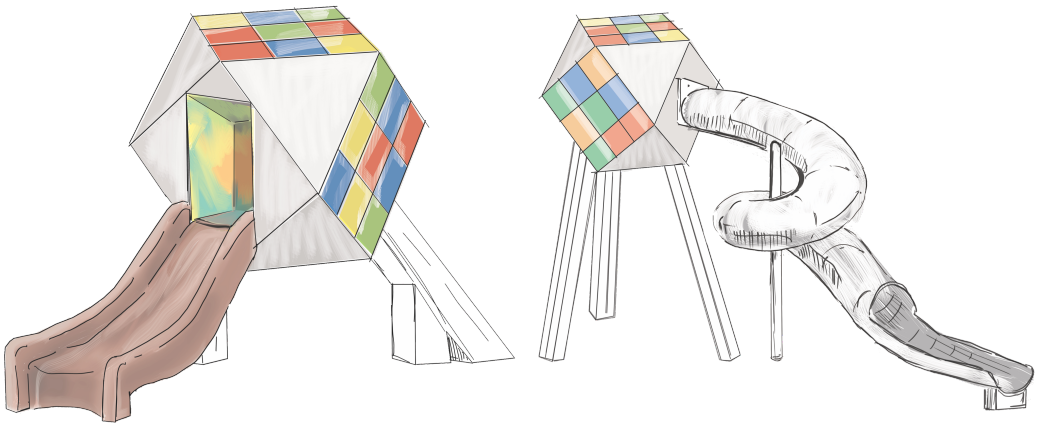

Figure 11. Example of slides

The playground has a large selection of climbing structures. One of which is cube-shaped with braided ropes (Figure 12.) for children ages 3 and up. Up to 5 children can climb at the same time. The highest point from the ground is 2.28 m.

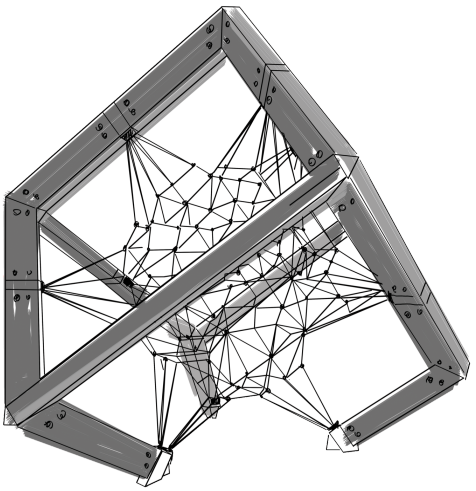

Figure 12. Example of climbing cube

Another construction for climbing is stilts. Stilts are located at a distance of 30 cm - 70 cm from each other. At the bottom of the stilts there are steps for the feet and the child will feel

confident. Stilts are made of smooth wood, on the sides of which there are handrail, thanks to which you can maintain balance.

The surface of the active zone is specially uneven due to artificial hills. Through which you can get through in two ways - crawl through the tunnel or climb the stairs from above. The height of the hill is 2 meters and it is completely covered with a rubber-covered playground. The height of another hill is 3.5 meter, at the foot of which there is a climbing structure in the form of cubes with different heights of steps (Figure 13.). The structure is designed to climb a hill, from which there will be a view of the entire playground. You can go down the slide.

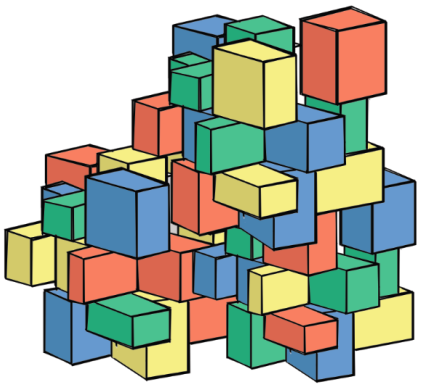

Figure 13. Example of climbing cube-steps

5.3.2. Sensory-rich zone

The sensory rich area is located at the entrance to the playground and is divided into several sub-areas, which imply different types of activities.. Represents game elements aimed at developing tactile and hearing sensations. This zone is perfect for children of all ages, especially small ones who are just starting to learn sensory integration.

The center of the sensory zone is a circle divided into a sandbox on one side and an area for playing with water on the opposite side. Around the sandbox is a health trail. The trail is a path lined with various materials - stones of various shapes, sawdust, sand, hay, etc. It is equipped in such a way that bare feet can walk on different tactile surfaces that will massage the feet. Influencing them with varying degrees of intensity, it will help increase the child's immunity, energy, relieve stress and improve his general psycho-emotional state. The opposite site is designed for playing with water and sand (Figure 14.). Thanks to special equipment, children will get acquainted with the physical properties of the elements during

the game. A small fountain supplies water every 3 minutes for 20 seconds, the water of which can be used to play. Excess water flows into a ravine near the site, where it seeps through the stones and flows back through the pumps to the fountain. The fountain is closed during the cold season.

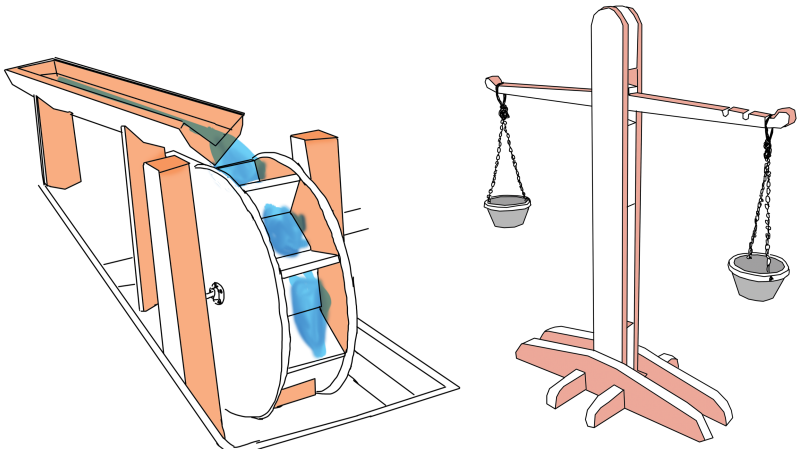

Figure 14. Example of water-play equipment

Another attractive part of this zone is a musical corner (Figure 15.) with instruments such as a xylophone and a drum that children can play with their hands or special hammers. Also, one of the interesting elements of the game is the negotiation tube, which transfers messages from one side to the other. 4 people can talk at the same time.

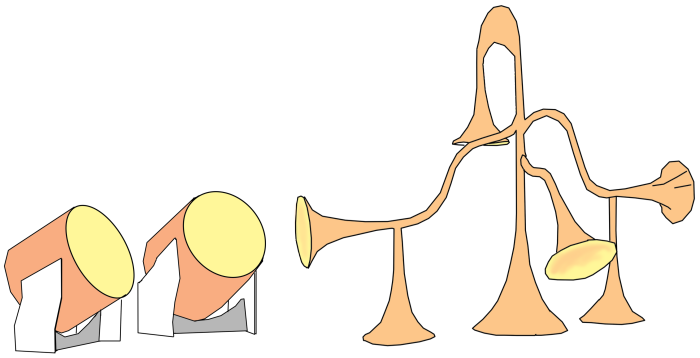

Figure 15. Example of musical instrumental

Not a standard element of this zone is the round trampoline at ground level (Figure 16.). The attraction for children of all ages. The trampoline frame is very durable and the trampoline jumping mat is made of durable woven polypropylene. In addition to this, the open mesh design of the jump mat ensures that the mat does not get hot and will always provide a cool feeling while jumping.

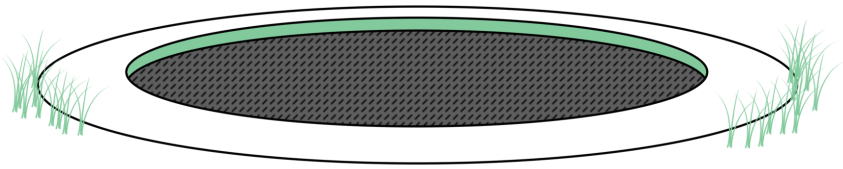

Figure 16. Example of trampoline

Creative sub-area with tables and benches for drawing and rest. One of the sides is surrounded by a not high wall, a covering that allows you to draw on it like on a blackboard. The wall also plays the role of a communication board.

5.3.3. Sensory Garden

The sensory garden is located in a green area around the playgrounds. This area is designed for quiet relaxation and privacy. Trees serve as soundproofing and provide an opportunity to enjoy nature.

One of the entrances to the park is an alley with colored walls (Figure 17.). The main feature of the design is the walls that refract light. The alley is located on the eastern side of the park, where on a sunny day the sun's rays will perfectly pass through the colored windows.

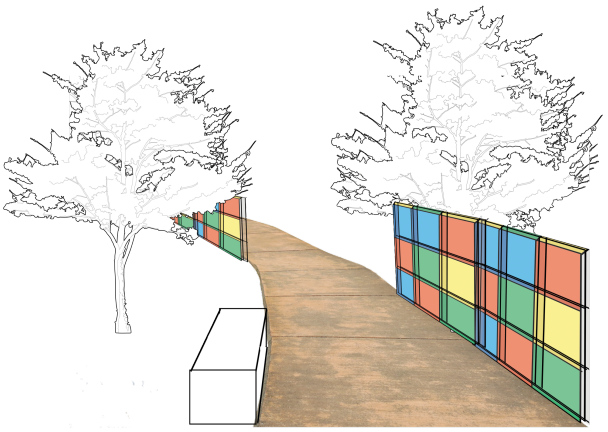

Figure 17. View of alley with colored walls

The hexagonal gazebo (Figure 18.) is the perfect place for privacy. 3 walls are made of wooden beams and 2 other walls let in light due to acrylic transparent windows. This design allows plants to grow inside the gazebo.

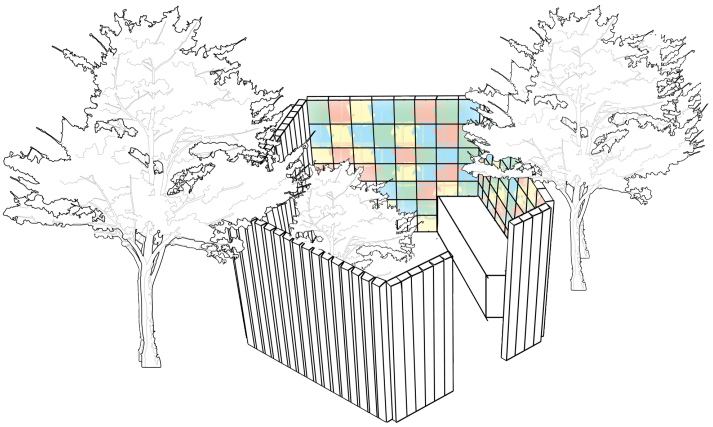

Figure 18. View of gazebo

There are 3 places in the area where three trees form a triangle. The stretched netting between the three trees functions as a large hammock. The distance from the ground to the hammock is 50 cm and allows up to 3 people to lie on it at the same time.

The park benches are also made in a special design in accordance with the idea of the Rubik's cube - with colored cubes at the base (Figure 19.). Benches are located in each area of the park. In the playground area there are long benches, in the sensory garden area - a bench up to 2 meters long.

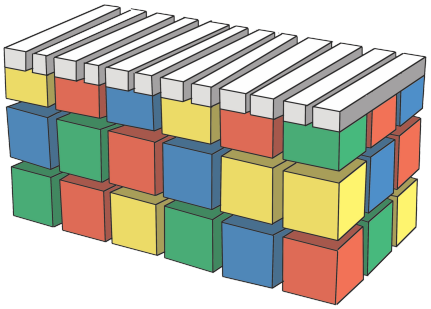

Figure 19. View of bench

The place connecting the playground zones and sensory garden is a wooden terrace. On the side of the sensory-rich zone, there is a long bench along the terrace, allowing you to sit on both sides.

5.4. Technical Drawing

5.4.1. Technical drawing of park bench

Bench dimensions are indicated in millimeters. The technical drawing of the park bench is shown in Appendix 3.

The bench is made in accordance with the design of the Rubik's cube. The bench seat has dark brown weather-resistant beams attached to it with 30mm oval head bolts. These bolts are used to prevent clothing from getting stuck or torn while sitting. The structure of the bench is made of concrete, the decor in the form of cubes is also made of concrete and covered with moisture-resistant paint in 4 colors (blue, red, yellow, green). The colors of the cubes do not have a sequence, the main condition is that three identical colors do not stand next to each other. The bench is installed on a stable surface, that is, on a concrete slab, and is attached to it with 615 mm long anchor bolts. These anchor bolts are attached to the bench legs with 30mm hex head bolts.

5.4.2. Technical drawing of terrace

The dimensions of the terrace are indicated in millimeters. The technical drawing of the park terrace is given in Appendix 4.

The terrace is located 400 mm from the ground. The material of the terrace is larch boards, which create a durable, aesthetic and pleasant touch to the surface. Larch has a high density, therefore it is not subject to decay, is resistant to insects and retains its original appearance for a long time. The top of the tree is covered with 2 layers. It is worth covering the terraces twice a year with one layer of wax.

The terrace is one-level and the frame is made of wooden beams. The lower beams are 805 mm apart, the distance between the upper beams is 2100 mm. The frame of the terrace is installed on a columnar concrete foundation. The bar is attached to the foodament with metal plates with anchor bolts, the length of which is 805 mm.

On the left side of the terrace is a bench, which seats are located on both sides of the back. The bench frame fits into the terrace frame and is fixed with 150 mm bolts to the terrace beams. The material of the bench is also wood.

5.4.3. Technical drawing of slide

The dimensions of the slide are indicated in millimeters. The technical drawing of the playground slide is given in Appendix 5.

The children's slide is a complex structure consisting of a slide and a house to which the slide is attached. The descent of the slide is a spiral closed slide with a height of 2140 mm from the ground. The frame of the slide is made of stainless steel covered with 5 mm plastic. The inner diameter of the slide is 650 mm. The slide spiral is bolted to the support metal pipe. The slide itself is attached to a hexagonal house, at the base of which is a square. The house stands on support beams, which are fastened to the concrete foundation with anchor bolts, the length of which is 615 mm.

5.4.4. Technical drawing of gazebo

The dimensions of the gazebo are indicated in millimeters. The technical drawing of the playground slide is given in Appendix 6.

The gazebo is made in the shape of a hexagon, consisting of 5 walls. 3 walls are made of wooden planks and 2 others are a wall with multi-colored windows that refract light.

The frame of the wooden walls is made of metal pipes to which wooden boards are attached. Wooden boards are made of larch, durable and high quality wood. The width of the boards is 40 mm and the distance between them is 10 mm. The boards are attached to metal pipes with 30 mm nails and the boards are fixed to each other with a stainless steel plate with the same 30 mm nails. Metal pipes are fixed to the foundation with anchor bolts, the length of which is 480 mm.

The wall with multi-colored windows is made of metal pipes that are fused together in the form of a lattice. The lattice forms square windows measuring 300x300 mm. The windows are made of acrylic plastic, the properties of which include the transmission of 90% of ultraviolet rays. Also, the advantage of this material is moisture resistance and impact resistance.

CONCLUSION

The aim of the work was to create a play space design for attracting children with the autism spectrum. It was very important to formulate design principles that would correspond to their characteristics and needs. In my opinion, the wishes of the parents who took part in the survey and the recommendations of the specialist were taken into account. The new design of the Ihaste playground has three distinct zones, which are separated by an asphalt path. This path is a visual guide for children. I have selected such children's equipment, which is both understandable to use and attracts attention at the same time. An alternative communication method is a drawing board in the creative corner of the sensory-rich area. And the sensory garden will become a place where you can relax and enjoy nature.

The children with ASD are also part of our society and they need as much care and support as the other children, so we should consider a social environment with all inclusive play environments where the children with these varied forms of ASD can play with their siblings, friends and non-friends. Therefore more tolerance and acceptance from the society as a whole would make their process of growth easier and comfortable.

KOKKUVÕTTE

Töö eesmärk oli luua mänguruumi kujundus autismiga laste ligimeelitamiseks. Oli väga oluline sõnastada disaini põhimõtted, mis vastaksid nende omadustele ja vajadustele. Minu arvates võeti arvesse uuringus osalenud vanemate soove ja spetsialisti soovitusi. Ihaste mänguväljaku uues kujunduses on asfaltteega eraldatud kolm eraldi ala. See tee on lastele visuaalne abivahend. Olen valinud sellise laste varustuse, mille kasutamine on nii arusaadav kui ka äratab tähelepanu. Alternatiivne viis suhtlemiseks on joonestuslaud sensooririkka ala loomingulises nurgas.

ASD-ga lapsed on samuti osa meie ühiskonnast ning nad vajavad sama hoolt ja tuge kui teised lapsed, seega peaksime mõtlema keerulise mängukeskkonnaga sotsiaalsele keskkonnale, kus saaksid mängida need ASD-vormiga lapsed. Seega muudab suurem sallivus ja aktsepteerimine kogu ühiskonna jaoks nende kasvuprotsessi lihtsamaks ja mugavamaks.

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APPENDIXES

Appendix 1. Case studies - photos of Successful examples of playgrounds for children with ASD

Photo 1 - 3. Lafayette Playground (Author: Julia Gidwani)

Photo 4 - 5. H!gh Five park (Author: William Bretzger)

Photo 6 - 7. Sensory Arts Garden (Source: dirtwork.us/portfolio)

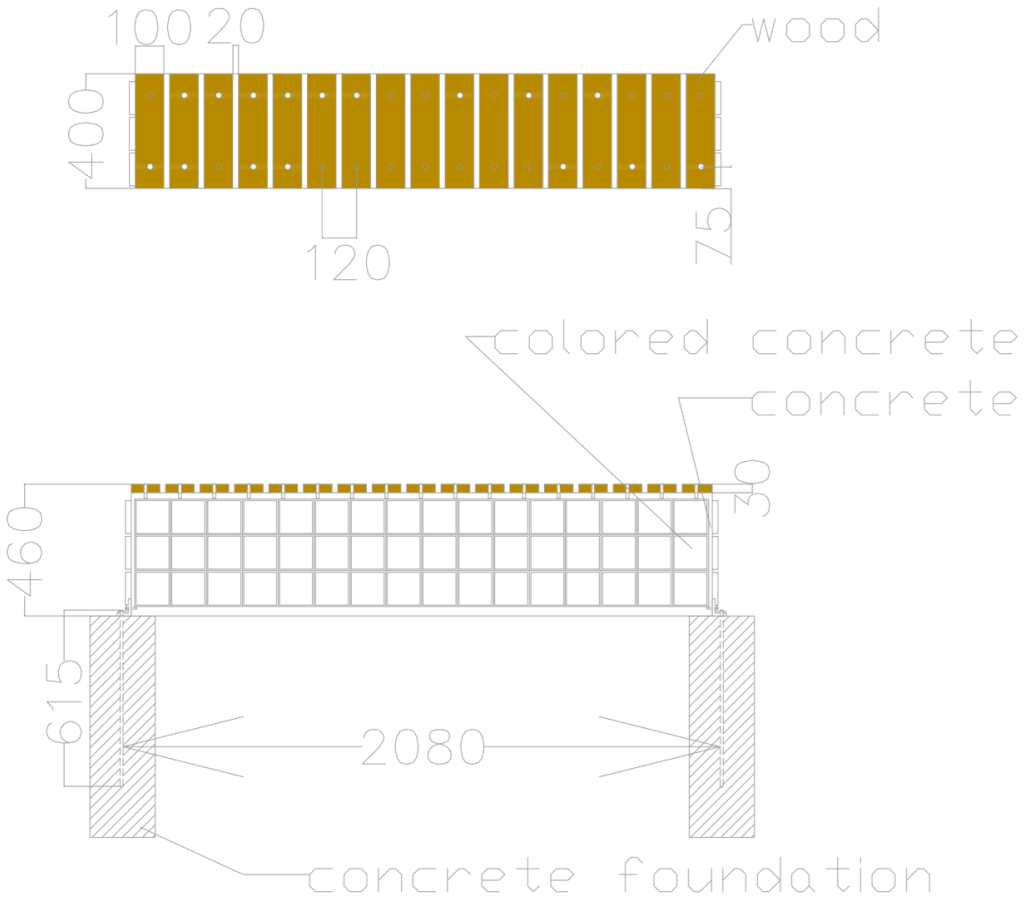
Appendix 2. Design area - photos of current playground in Ihaste





Photo 8 - 12. Current playground of Ihaste (Foto: Darja Korjukina, 19.10.2020)

Appendix 3. Technical solution of bench



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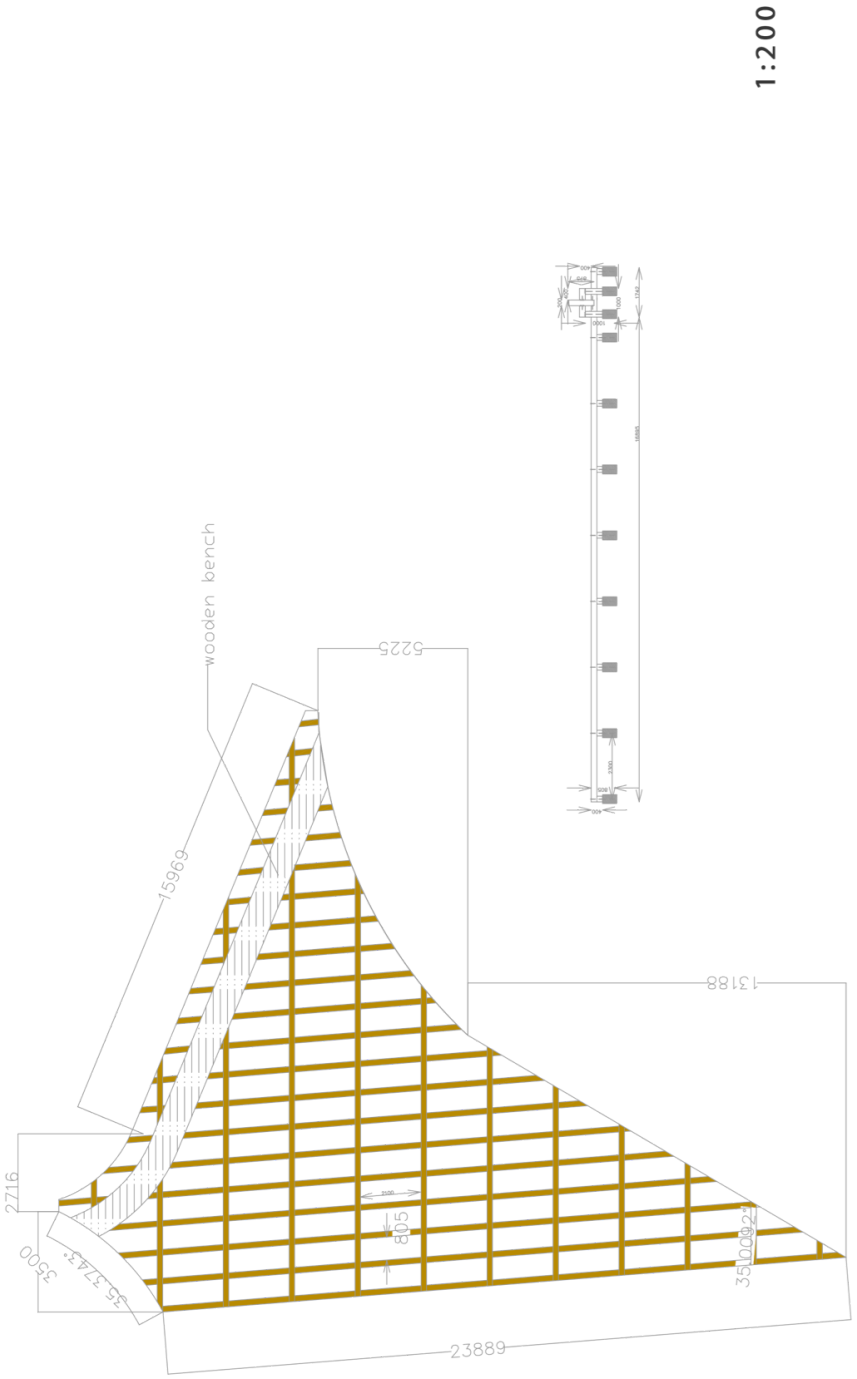
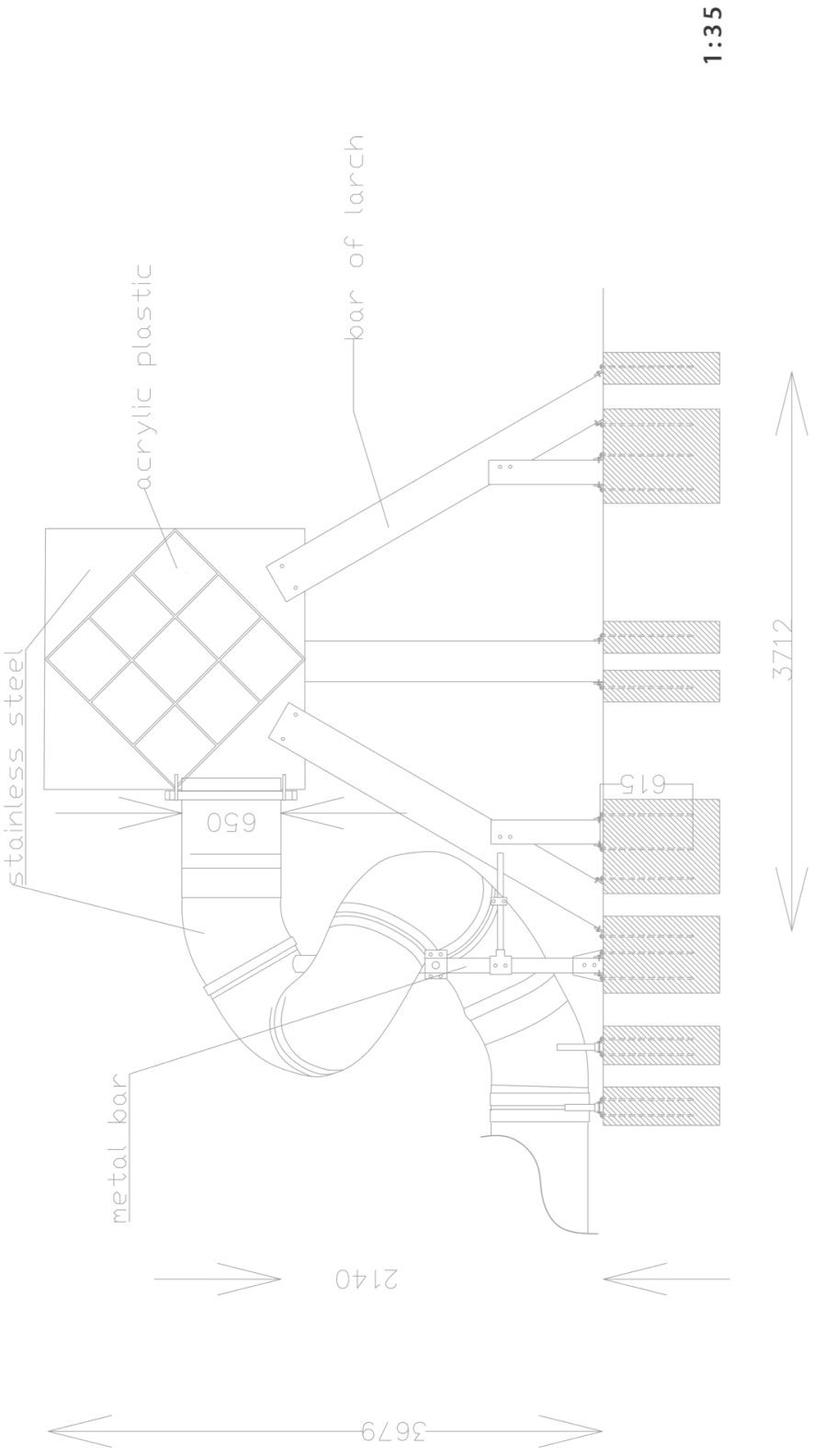
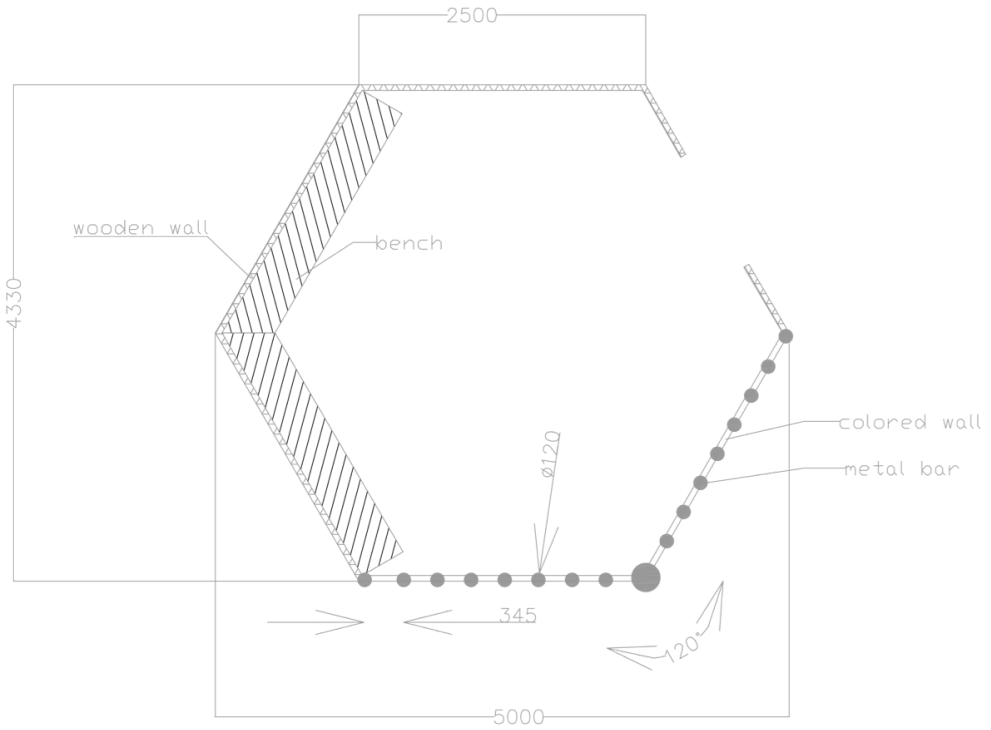
Appendix 4. Technical solution of terrace

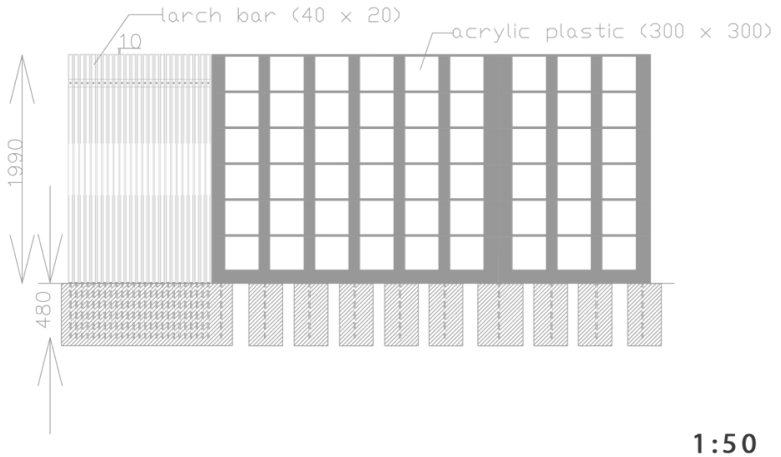


Appendix 5. Technical solution of slide



Appendix 6. Technical solution of gazebo





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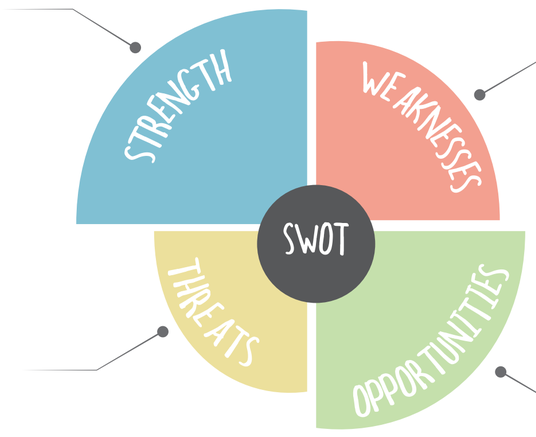
Appendix 7. Posters

1 RUBIX PLAYGROUND

SITE ANALYSIS

The focus area design is found in Tartu, in the district of Ihaste, located on the left bank of the Emajõgi river, in the south-eastern part of Tartu. The area of the district is 424 hectares and the population density is conducive to 547 people per square km. It is due to the fact that Ihaste is located on the outskirts of Tartu, it is very calm and the perfect place to relax from the city bustle.



- Quiet area
- 5 minutes from the site bus stop with route leading to the city center
- Around the focus area asphalt paths for bike and pedestrian
- Quiet road traffic

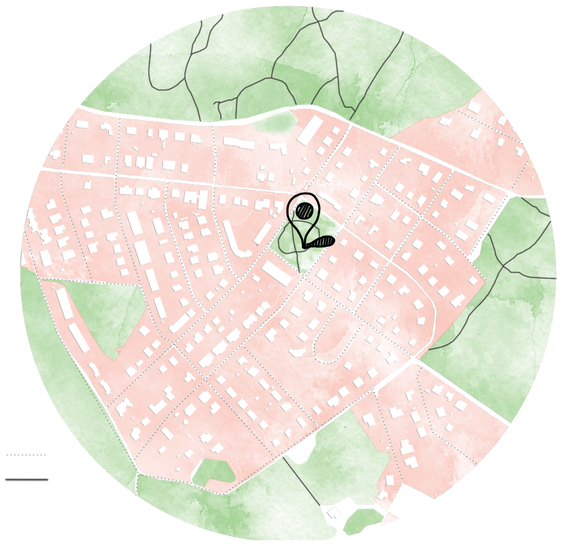
- Not all pedestrian walkways laid out asphalt
- No nearby kindergardens andschools

- Increasing road traffic around the playground due to a large number of visitors

- Re-equipment of the current playground
- Solution for pastimes and families with special children
- Attracting new residents from other areas
- New place of children's institutions in Ihaste

WALKABILITY

Speaking of pedestrian roads, their condition and presence leaves much to be desired. The asphalt pedestrian road passes only on one side of the playground. Mainly pedestrians come to move from the edge of car roads, although road traffic on this site is quiet. Also, pedestrian paths pass through the nearby forest.



Unpaved pedestrian road
Foot path

CYCLABILITY

In addition to pedestrian roads, there is a bicycle road. The road held at the playground has divided, where one side is intended for pedestrians and the second side for cyclists. Also at the entrance to the park there is a city bicycle parking "Pallase", organized by Smart Bike. Parking is designed for 17 bikes.

Smart Bike stop
Bicycle path
Bicycle + pedestrian path

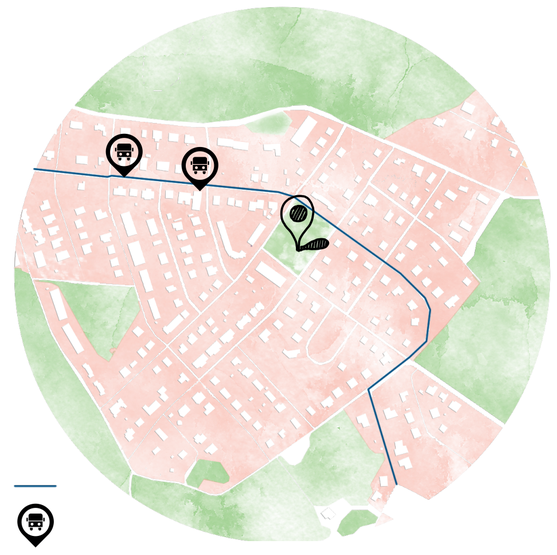
URBAN ENVIRONMENT

The surroundings of the planned park are largely located residential buildings of a one-storey and two-story building. The area is rich in forests, which is difficult to say that they develop along with the area. At the same time, there are no schools and kindergartens in the area and the designing of the park, can induce the city to think about the construction of children's institutions.

Green area
Residential area

BUS ABILITY

It is worth noting that in the area there are mainly people with prosperity and most families have a car, so the demand for public transport is low. However, you can get to the area of Ihaste by bus 5 and 12. The path of the bus just runs across the road, passing around the playground and a bus stop is located 5 minutes from the park. There is a chance that with increasing new visitors to the park, new route paths running through the Ihaste area will be developed.

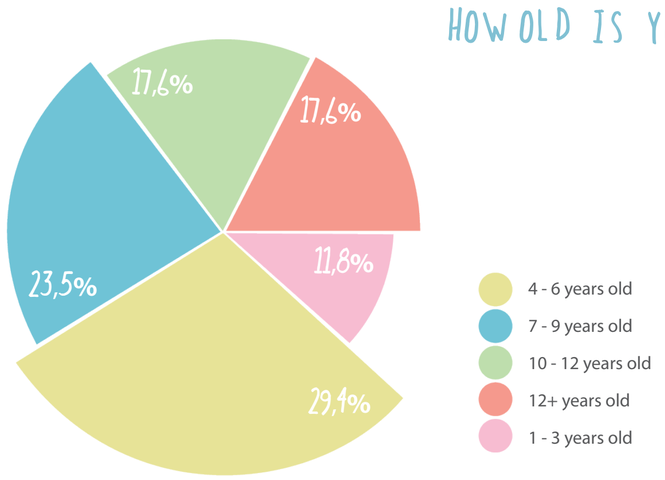


Bus line
Bus stop

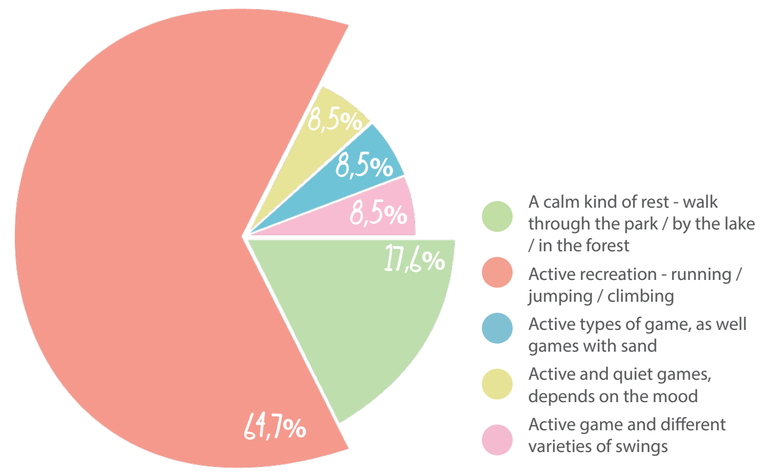
The purpose of the questionnaire was to identify the needs of children in a play environment, such as annoying and encouraging factors, favorite activity in the open air, as well as the personal opinion of the parent, that their child needs on the playground. The survey was compiled in Google Forms and was carried out in an anonymous form on a voluntary basis.

The survey involved 34 parents raising children with autism spectrum disorder of different age groups, among whom the age of 4-6 years - 29.4% (10 respondents) was the most popular, 7-9 years - 23.5% (8 people) , 10 - 12 years old and 12+ for 17.6% (6 people) and less age group 1 - 3 years old - 11.8% (4 people). There is a logical explanation for this, since in the first years of life the child is less interested in the playground and spends more time surrounded by his parents.

HOW OLD IS YOUR CHILD?



WHAT KIND OF ACTIVITIES DOES YOUR CHILD LIKE TO DO OUTSIDE?

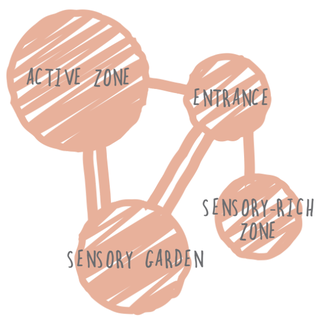


In the question about their children's favorite activity outside, the majority (64.7% - 22 respondents) voted for the option of active recreation, such as running / jumping / climbing, etc. Some also specified that in addition to outdoor activities, their children love playing with sand and on the swings. And only 6 people (17.6%) answered that their children prefer a calm type of outdoor recreation.

"The presence of a sandbox, preferably fenced, but not sandy cover. The ability to jump, run, slide and some devices to climb. Any carousel or swing. Any structures on springs so that the child can swing independently. Rubber coating; a swing on which the child can swing while lying down. Rest areas with single or double structural elements, where the child can recover from sensory overload. Enough distance between the individual elements of the playground."

ORDERLINESS

In order to create an ordered space, it must be "zoned". "Zones" should correspond to the types of activities performed in them and be equipped in accordance with their functional purpose.

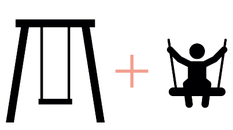


RECREATION AREA

It is a balance between active and quiet activities. Especially useful for children with hyperactivity. Aromatic plants, birdsong, secluded spots and the opportunity to lie down can serve as a calming effect.

FUNCTIONALITY

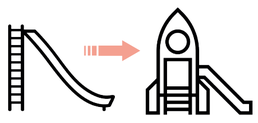
Non-congested space. All objects in the child's field of vision should be functional and give a clear understanding of what and where they could do.



DESIGN PRINCIPLES

ATTRACTIVENESS

Often, children with ASD are not motivated to play, so the play space must take into account the interests and needs of the child with ASD. The playground should encourage you to explore it.



AVAILABILITY OF ALTERNATIVE MEANS OF COMMUNICATION

Include a communication board that depicts the child's physiological needs (toilet, water, food, ...) and basic communication needs (asking for help, consent, refusal). These illustrations will greatly facilitate the child's interaction in the new environment for them and help to avoid unwanted problem behavior

VISUAL HINTS

Visual aids (information signs, pictograms, illustrations of behavior rules, visual scenarios) to help an autistic child navigate the world around him and form adaptive social behavior.

RUBIX PLAYGROUND

DESIGN OF PLAYGROUND

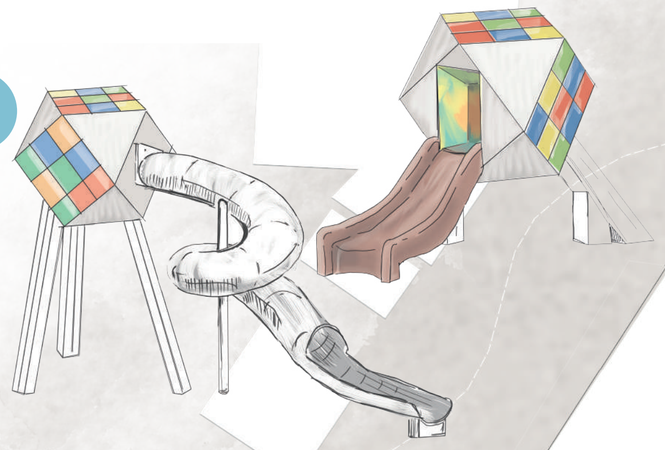
1 : 250

Active zone

Sensory Garden

Sensory - rich zone

1

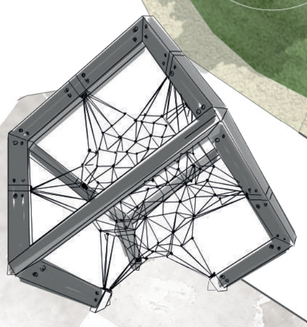


Two types of slides of different heights. The height of a small slide of 1.2 m is suitable for children under 5 years old. The height of the large slide is 2.2 m and is suitable for children over 5 years old. The slides are interconnected by a hinged tunnel.

2 ROUND SWING

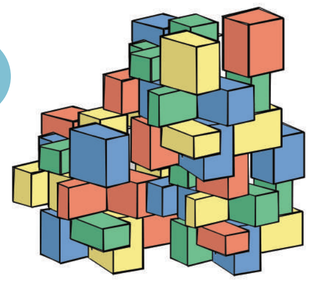
One of the main elements of the playground is a swing arranged in a circle and includes three types of swing - swing for one person (6 pieces); swing bench (4 pieces); cobweb swing (4 pieces). The swing is located at a safe distance from each other (2 m) and from the center and is suitable for swinging children and adults.

3



The cube-shaped climbing structure is suitable for children ages 3 and up. Up to 5 children can climb at the same time. The highest point from the ground is 2.28 m.

4



A climbing structure in the form of cubes with different heights of steps, which is located at the foot of the hillock. The structure is designed to climb a hill, from which there will be a view of the entire playground. The height of the hill is 3.5 meters. You can go down the slide.

5 PLAY HILL

Artificially created hills, through which you can get through in two ways - crawl through the tunnel or climb the stairs from above. The height of the hill is 2 meters and it is completely covered with a rubber-covered playground.

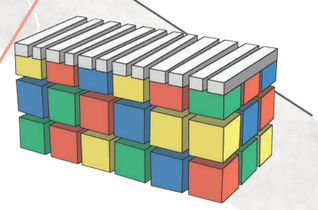
6 CLIMBING STILTS

Stilts are located at a distance of 30 cm - 70 cm from each other. At the bottom of the stilts there are steps for the feet and the child will feel confident. Stilts are made of smooth wood, on the sides of which there are handrail, thanks to which you can maintain balance.

7 HAMMACK

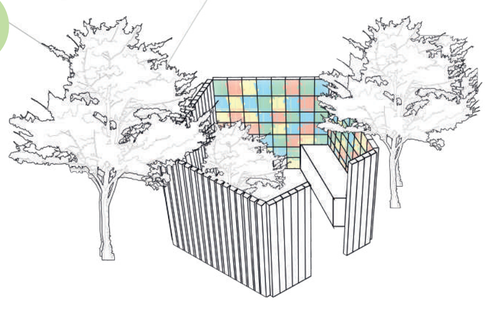
The stretched netting between the three trees functions as a large hammock. The distance from the ground to the hammock is 50 cm and allows up to 3 people to lie on it at the same time.

8



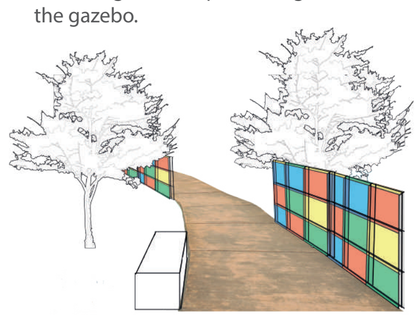
Bench with colored cubes at the base. Benches are located in each area of the park. In the playground area there are long benches of this type, in the sensory garden area - a bench up to 2 meters long.

9



The hexagonal gazebo is the perfect place for privacy. 3 walls are made of wooden beams and 2 other walls let in light due to acrylic transparent windows. This design allows plants to grow inside the gazebo.

10

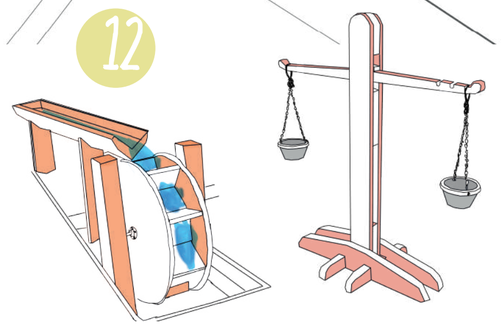


Alley with colored walls. The alley is one of the entrances to the park and the main feature of the design is the walls that refract light. The alley is located on the eastern side of the park, where on a sunny day the sun's rays will perfectly pass through the colored windows.

11 WOODEN TERRACE

A terrace connecting the playground and sensory garden areas. On the side of the sensory-rich zone, there is a long bench along the terrace, allowing you to sit on both sides.

12



The area is designed for playing with water and sand. Thanks to special equipment, children will get acquainted with the physical properties of the elements during the game. A small fountain supplies water every 3 minutes for 20 seconds, the water of which can be used to play. Excess water flows into a ravine near the site, where it seeps through the stones and flows back through the pumps to the fountain. The fountain is closed during the cold season.

13 CREATIVE AREA

Area with tables and benches for drawing and rest. One of the sides is surrounded by a not high wall, a covering that allows you to draw on it like on a blackboard. The wall also plays the role of a communication board.

14

A musical corner with instruments such as a xylophone and a drum that children can play with their hands or special hammers. Also, one of the interesting elements of the game is the negotiation tube, which transfers messages from one side to the other. 4 people can talk at the same time.

15

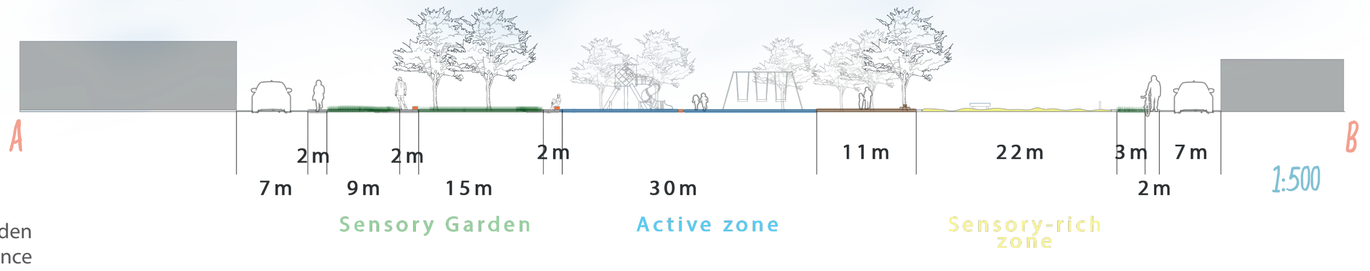
The round trampoline at ground level is an attraction for children of all ages. The trampoline frame is very durable and the trampoline jumping mat is made of durable woven polypropylene. In addition to this, the open mesh design of the jump mat ensures that the mat does not get hot and will always provide a cool feeling while jumping.

16 HEALTH TRAIL

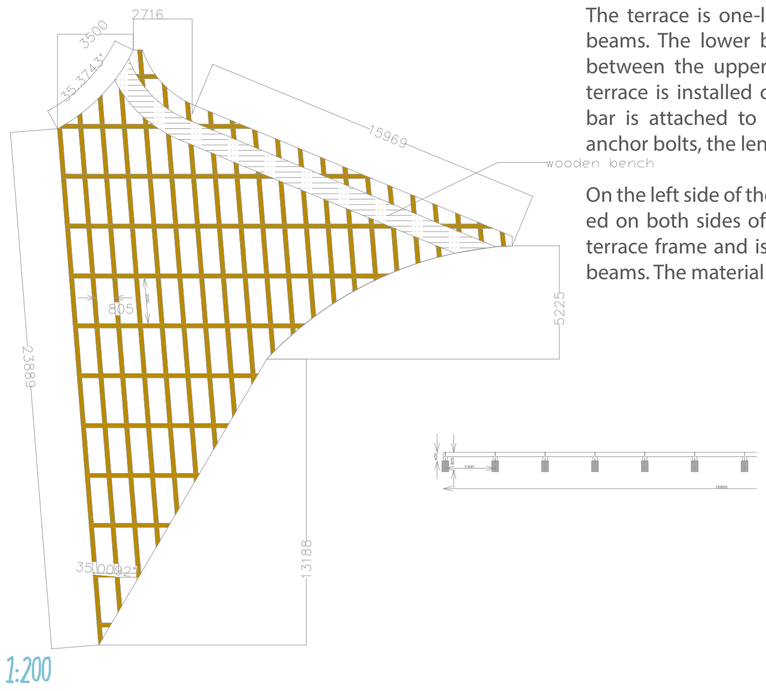
At the entrance to the playground, there is a sandbox around which a health trail runs. The trail is a path lined with various materials - stones of various shapes, sawdust, sand, hay, etc. It is equipped in such a way that bare feet can walk on different tactile surfaces that will massage the feet. Influencing them with varying degrees of intensity, it will help increase the child's immunity, energy, relieve stress and improve his general psycho-emotional state.

RUBIX PLAYGROUND

TECHNICAL SOLUTIONS



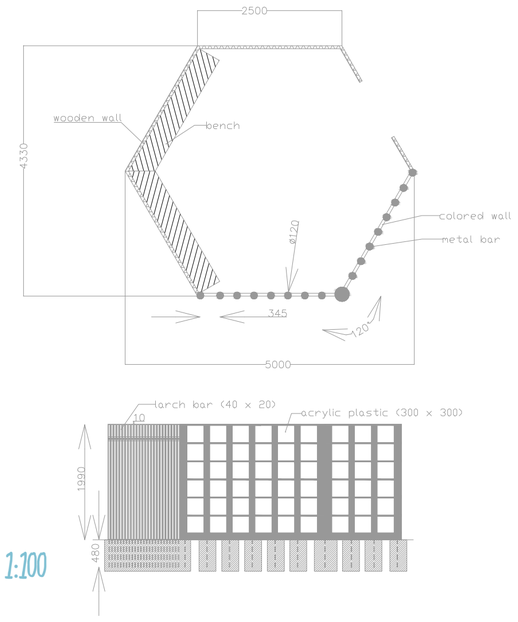
WOODEN TERRACE



The terrace is one-level and the frame is made of wooden beams. The lower beams are 805 mm apart, the distance between the upper beams is 2100 mm. The frame of the terrace is installed on a columnar concrete foundation. The bar is attached to the foodament with metal plates with anchor bolts, the length of which is 805 mm.

On the left side of the terrace is a bench, which seats are located on both sides of the back. The bench frame fits into the terrace frame and is fixed with 150 mm bolts to the terrace beams. The material of the bench is also wood.

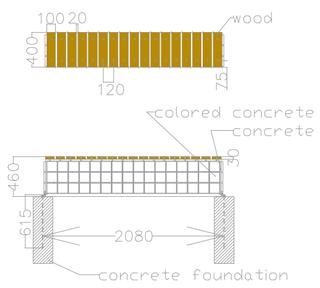
GAZEBO



The frame of the wooden walls is made of metal pipes to which wooden boards are attached. Wooden boards are made of larch, durable and high quality wood. The width of the boards is 40 mm and the distance between them is 10 mm. The boards are attached to metal pipes with 30 mm nails and the boards are fixed to each other with a stainless steel plate with the same 30 mm nails. Metal pipes are fixed to the foundation with anchor bolts, the length of which is 480 mm.

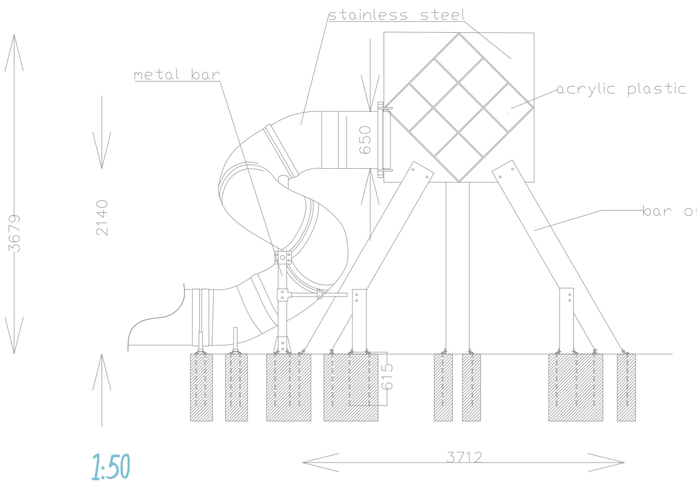
The wall with multi-colored windows is made of metal pipes that are fused together in the form of a lattice. The lattice forms square windows measuring 300x300 mm. The windows are made of acrylic plastic, the properties of which include the transmission of 90% of ultraviolet rays. Also, the advantage of this material is moisture resistance and impact resistance.

PARK BENCH



The bench is made in accordance with the design of the Rubik's cube. The bench seat has dark brown weather-resistant beams attached to it with 30mm oval head bolts. These bolts are used to prevent clothing from getting stuck or torn while sitting. The structure of the bench is made of concrete, the decor in the form of cubes is also made of concrete and covered with moisture-resistant paint in 4 colors (blue, red, yellow, green). The colors of the cubes do not have a sequence, the main condition is that three identical colors do not stand next to each other. The bench is installed on a stable surface, that is, on a concrete slab, and is attached to it with 615 mm long anchor bolts. These anchor bolts are attached to the bench legs with 30mm hex head bolts.

PLAYGROUND SLIDE



The children's slide is a complex structure consisting of a slide and a house to which the slide is attached. The descent of the slide is a spiral closed slide with a height of 2140 mm from the ground. The frame of the slide is made of stainless steel covered with 5 mm plastic. The inner diameter of the slide is 650 mm. The slide spiral is bolted to the support metal pipe. The slide itself is attached to a hexagonal house, at the base of which is a square. The house stands on support beams, which are fastened to the concrete foundation with anchor bolts, the length of which is 615 mm.

VIEW OF ALLEY IN SENSORY GARDEN